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Amendments to the Claims

This listing of claims will replace all prior versions and listing of claims in the application

Claim 1- 9 (cancelled)

Claim 10 (new): A highly energy-efficient improved power cogeneration process further developing ultra-low exhaust emissions during a conversion of gaseous or liquid hydrocarbon fuel energy into mechanical or electric power energy and recoverable waste heat energy for applied useful purposes, the process comprising:

(a) maintaining a steady-state process condition within a partially-open energy conversion cycle, wherein a controlled mass flow of exhausted cycle composition gases are in mass flow equilibrium with combined controlled mass flows of fuel and oxygen-predominant gas mixture entering the partially-open cycle;

(b) recirculating a steady-state continuous cycle gas flow of recycled superheated gases having an unaltered and greatly predominant combined mixture composition of carbon dioxide and water vapor in Mol percent ratio proportions identical to those proportions of carbon dioxide and water vapor as produced from a gaseous or liquid hydrocarbon oxy-fuel combustion chemical reactions within a combustion burner assembly;

(c) accelerating a speed of achieved combustion burner zone equilibrium temperatures, wherein thermal radiant heat adsorption characteristics of the controlled mass flow of admitted cycle composition gases into a combustion burner's internal primary combustion zone can rapidly adsorb an oxy-fuel's released heat energy from combustion product gases at approximately the speed of light to establish the equilibrium temperature of combined gases within the combustion zones;

(d) communicating and distributing low pressure superheat recirculated cycle exhaust gases downstream of provided waste heat recovery exchanger means through recycle exhaust gas distribution manifold means therein communicating separate branch conduit controlled streams of recirculated cycle

exhaust gases that can be discharged from the partially-open cycle and/or connected to a primary recycle compressor;

(e) communicating a recycle compressor discharged flow of primary re-pressurized recycle gas through a power turbine exhaust gas waste heat recovery unit exchanger section, therein further developing discharged working motive fluid conduit streams of highly increased superheat temperature and end-connectivity to a downstream-positioned combustion burner assembly;

(f) introducing pressurized flow-controlled streams of fuel and predominant oxygen gas mixture into an oxy-fuel combustion burner assembly;

(g) introducing additional pressurized flow-controlled streams of working motive fluid and a lesser stream of cooled primary re-pressurized recycle gas into an oxy-fuel combustion burner assembly's partial-premix subassembly, thereby providing a method of controlling and maintaining a combustion burner assembly's desired internal primary combustion zone temperature and a downstream-positioned discharged internal tertiary blending zone temperature of cycle composition gases having connectivity with a downstream-positioned hot gas expansion power turbine or power turbine assembly;

(h) communicating a controlled temperature flow of pressurized discharged cycle composition gases from a combustion burner assembly to a downstream-positioned hot gas expansion power turbine (or power turbine assembly) therein developing the cycle's output shaft mechanical power;

(i) communicating a discharge flow of expanded power turbine assembly exhaust gases having reduced superheat temperature and pressure to downstream-positioned waste heat recovery exchangers wherein recoverable useful heat energy can be extracted from the cycle exhaust gases for transfer to other internal cycle and external cycle process fluid streams;

(j) employing control means wherein PLC control panel functions safety-monitors and controls the conversion cycle's process mass flow streams of fluids entering and exiting the partially-open energy

conversion cycle and internal cycle gas streams to maintain desired cycle gas stream temperatures and pressures as required by the operating partially-open energy conversion cycle process;

(k) providing an accelerated speed of controlled combustion burner's internal primary combustion zone equilibrium temperatures wherein chemical combustion reactions are deigned the requisites of Time and Temperature required to produce exhaust gas emissions of carbon monoxide and nitrogen oxides;

(l) continuing this series of process steps to produce a desired conversion rate of gaseous or liquid hydrocarbon fuel energy into mechanical or electric power energy and recoverable heat energy for applied useful purposes.

Claim 11 (new): The process of claim 10 additionally including a cycle step of exhausting a controlled portion of recirculated cycle composition exhaust gases from the partially-open cycle wherein, the discharging or venting of gases from the cycle are typically, but not limited to, the venting of cycle composition exhaust gases to atmosphere.

Claim 12 (new): The process of claim 10 additionally including an addition of an attached added end-branch conduit to the end of the exhaust gas distribution manifold, the conduit communicating controlled-flows of recirculated cycle gases for an alternative added energy conversion cycle process stream comprising:

(a) a fuel energy to heat conversion cycle stream positioned in parallel with the fuel energy to power conversion cycle stream portion within the overall partially-open energy conversion cycle process;

(b) a low pressure and low superheat temperature recirculated exhaust gas flow of cycle composition gases having end-connectivity to either one or preferred two or more parallel-positioned exhaust recycle gas blowers which provide a slightly re-pressurized and controlled flow of cycle composition gas streams connecting to a downstream-positioned oxy-fuel combustion burner assembly wherein a conversion of fuel energy to heat energy takes place;

(c). An oxy-fuel combustion burner assembly to which controlled fluid streams are end-connected to, the fluid streams comprising

(1) a flow stream of slightly pressurized fuel connected to a partial-premix subassembly within the burner assembly,

(2) a first flow stream of a slightly pressurized exhaust recycle gas blower discharged gas of low superheat temperature connected to a partial-premix subassembly within the burner assembly,

(3) a flow stream of a slightly pressurized predominant oxygen gas mixture connected to a partial-premix subassembly within the burner assembly, and

(4) a second supplied flow stream of a slightly pressurized exhaust recycle gas blower discharged gas of low superheat temperature connected to a burner assembly tertiary zone;

(d) a communication of an oxy-fuel combustion burner assembly's high superheat exhaust gases having a process stream end-connectivity with a downstream-positioned waste heat recovery exchanger having a common inlet connection further connected with a conduit communication of a lesser portion of exhaust gases discharged from a power turbine assembly;

Claim 13 (New): The conversion of fuel energy to heat energy process stream of claim 12 wherein the oxy-fuel combustion burner assembly functions to blend admitted cycle fluid streams within a partial-premixer sub-assembly to carryout an example internal primary combustion zone maximum preferred 2400°F controlled combustion equilibrium temperature and to further provide a downstream-positioned tertiary zone blending of introduced cycle gases to carryout an example preferred approximate burner assembly discharge temperature of 1390°F corresponding to an example preferred gas power turbine exhaust's approximate temperature of 1390°F.

Claim 14 (New): The process of claim 10 wherein, the rate at which fuel energy is converted into mechanical or electrical power energy and accompanying recoverable waste heat energy within the

overall partially-open energy conversion cycle process can be independent of the alternative added process stream's controlled conversion rate of fuel energy to useful heat energy purposes.

Claim 15 (New): The process of claim 10 wherein, applied unique thermal and thermodynamic characteristics of employed cycle composition gases therein yields high gas turbine cogeneration efficiencies from a recycling of approximately 80% of the partially-open cycle's total recoverable turbine exhaust waste heat energy back into a combustion burner assembly's next cycle's conversion of fuel energy to power and/or useful heat energy.

Claim 16 (New): The highly energy-efficient power cogeneration process of claim 10 wherein, the increase in operating thermal efficiencies over that of Current Best Available Technology cogeneration processes additionally corresponds to combined decreases in facility processes' required fuel consumptions and resulting further decreases in a facility's carbon dioxide 'greenhouse' exhaust gas emissions.

Claim 17 The highly energy-efficient power cogeneration process of claim 10 wherewith in the partially-open turbine cogeneration cycle system, preferred high cogeneration efficiencies can be achieved from a presented example of an employed 42.5% simple-cycle efficiency gas turbine operating with a 60 psia combustion burner pressure, although similarly preferred high cogeneration efficiencies can be achieved with from other operational variables.

Claim 18 (New): A highly energy-efficient improved power cogeneration system further developing ultra-low exhaust emissions during a conversion of gaseous or liquid hydrocarbon fuel energy into mechanical or electric power energy and recoverable waste heat energy for applied useful purposes, the system comprising:

(a) a first conduit within a partially-open energy conversion cycle, the conduit therein functioning as a gas distribution manifold for receiving a previous cycle's recirculated and slightly superheated exhaust

gas mixture stream and further having branch or manifold end-conduit means for controlled distribution of gases having communication with

(1) a first branch connecting conduit containing gas pressure and flow control devices and having end gas flow connection to atmosphere,

(2) a second branch connecting conduit having end gas flow connection to the inlet of a primary recycle gas compressor, and

(3) a manifold end-connection with attached blind flange that can be alternatively connected to the inlet of an added cycle gas stream;

(b) a primary recycle gas compressor which re-pressurizes supplied low pressure recirculated exhaust gases to a higher pressure as required for the desired operating pressure within the subsequent down-stream connected combustion burner assembly, the primary recycle gas compressor configured as

(1) that of a conventional gas turbine compressor driven by shaft means connecting to one or more hot gas expansion stages within a power turbine assembly, or

(2) that of an alternative separate compressor driven by an electric motor or steam turbine driver;

(c) a second conduit containing a primary recycle compressor's discharged flows of re-pressurized primary recycle gas in communication with

(1) a side-branch conduit containing a gas/air cooling exchanger, gas flow control valve means, and having downstream conduit end communication of gases with a combustion burner assembly's partial-premix subassembly, and

(2) two parallel end-branch conduits, each branch conduit having a flow control valve and end-connected to a exhaust gas waste heat recovery exchanger section wherein the re-pressurized primary recycle gas flow streams are greatly increased in temperature to become working motive fluid streams;

(d) a second working motive fluid conduit stream discharged from the exhaust gas waste heat recovery exchanger section having downstream connectivity to an internal primary combustion zone contained within a oxy-fuel combustion burner assembly;

(e) a first working motive fluid conduit stream discharged from the exhaust gas waste heat recovery exchanger section and having connectivity to the tertiary zone contained within a combustion burner assembly;

(f) a remote source of pressurized fuel supplied through a conduit containing a pressure control valve and connecting to a downstream-positioned partial-premix sub-assembly within a combustion burner assembly;

(g) a remote source of pressurized predominant oxygen gas mixture supplied through conduit containing a pressure control valve and connecting to a downstream-positioned partial-premix sub-assembly within a combustion burner assembly;

(h) a communication of discharged gases from a combustion burner assembly to the inlet of a power turbine assembly as contained within a conventional gas turbine power unit, or alternatively contained within a separately connected hot gas expander power unit assembly;

(i) a third conduit communicating turbine exhaust gases from a power turbine assembly to downstream parallel-positioned first and second end branch conduits having connectivity to a first exhaust gas waste heat recovery exchanger's parallel-positioned exhaust gas waste heat recovery exchanger sections, wherein

(1) recoverable heat is transferred within the first section from the turbine exhaust gases to parallel first and second flow-controlled working motive fluid streams have downstream communication with a combustion burner assembly, and

(2) recoverable heat is transferred within the second section from the turbine exhaust gases, and/or transferred from an alternative added process stream's developed conversion of fuel energy to combustion

burner discharged exhaust gases, to other heat energy adsorbing connected fluid streams having pressurized communication with remote steam or other heated fluid processes;

(j) a recirculated exhaust gas manifold having inlet connectivity to the first exhaust gas waste heat recovery exchanger's parallel discharged exhaust gas end-branch conduits, each branch conduit having a flow control valve and end-connected to a common inlet of the recirculated exhaust gas manifold;

(k) a second exhaust gas waste heat recovery exchanger having an inlet exhaust gas connectivity with the recirculated exhaust gas manifold and an outlet connectivity with a downstream-positioned turbine exhaust gas distribution manifold.

Claim 19 (New): The highly energy-efficient improved power cogeneration system of Claim 18 wherein a second exhaust gas waste heat recovery exchanger can transfer additional recoverable heat energy from exhaust gases discharged from a first exhaust gas waste heat recovery exchanger, the additional recoverable heat being transferred into the second exhaust gas waste heat recovery exchanger's connected lower temperature pressurized fluid streams that can comprise heat energy adsorbing liquid streams having communication with remote steam condensate or other heated fluid processes;

Claim 20 (New): The highly energy-efficient improved power cogeneration system of Claim 18 wherein the power turbine assembly may be as contained within a conventional gas turbine power unit assembly, or alternatively configured as a conventional hot gas expander power unit that conventionally shaft-drives an electrical generator or other rotating mechanical equipment.

Claim 21 (New): The highly energy-efficient improved power cogeneration system of Claim 18 wherein control of individual system fluid stream mass flows, temperatures, pressures, and system power output is required, the control system comprising:

(a) individual conduit streams having mass flow, temperature, and pressure sensors for safe operation monitoring as required;

(b) system gas streams having flow control valve means and/or motor speed control means to control gas flows as required;

(c) PLC functions incorporated within the PLC control panel, motor control center and switchgear as collectively provided for within a control room module.